REMARKS

In the Office Action, the Examiner indicated that claims 1 through 37 are pending in the application and the Examiner rejected claims 1-16 and 18-37.

Claim Rejections, 35 U.S.C. §103

On page 3 of the Office Action, the Examiner rejected claims 1-6, 9-16, 18-19, 21-23, 25-30, and 33-37 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,212,263 to Sun et al. in view of U.S. Patent No. 6,067,316 to Amrany et al. On page 6 of the Office Action, the Examiner rejected claims 7-8, 24, and 31-32 under 35 U.S.C. §103(a) as being unpatentable over Sun et al. in view of Amrany et al. and further in view of U.S. Patent No. 4,803,719 to Ulrich. On page 7 of the Office Action, the Examiner rejected claim 20 under 35 U.S.C. §103(a) as being unpatentable over Sun et al. in view of Amrany et al., and further in view of U.S. Patent No. 6,169,762 to Embree et al.

The Present Invention

This invention improves the attenuation of an undesired signal found in a differential signal path by using inductive, as opposed to capacitive, coupling. The inventive electrical interface includes a primary inductor, a secondary inductor, and a filter. The primary inductor and the secondary inductor operably couple an input differential signal pair to an output differential signal pair, and the filter attenuates an undesired signal in the output differential

signal pair. The input differential pair is formed by using a differential driver, e.g., a CODEC, to generate the pair from a single input line (e.g., a tip line).

The invention includes a parasitic capacitor operably coupled between the primary and the secondary inductor. The parasitic capacitor has a capacitance that is as small as possible while still preventing common mode noise signals from interfering with signals being transmitted over the input differential pair. In a preferred embodiment, the capacitance is in the range of approximately 0.5 pF to approximately 2.5 pF.

The invention also includes a method for interfacing an input differential signal pair to an output differential signal pair. In particular, the method includes the steps of inductively coupling the input differential signal pair to an output differential signal pair, and filtering out a common mode signal occurring in the output differential signal pair. The inventive method improves the attenuation of an undesired signal found in a differential signal path by using inductive coupling.

U.S. Patent No. 6,212,263 to Sun et al.

U.S. Patent No. 6,212,263 to Sun et al. ("Sun") teaches a combination X digital subscriber line (xDSL) and analog modem that includes a computer bus interface, CODECs, an analog front end for xDSL communications coupled to a POTS line and a direct access arrangement for analog communication also connected to the POTS line. Sun is teaching the transfer of ADSL data in the 10 kHz to 1 MHz band also referred to as "base band". These base band signals are those signals defined in the ADSL standard E1-T1 413 issue 2 and its

successors. ADSL data by its nature is high entropy data, that is, it contains large amounts of information in each symbol. As is well known, there are clear differences in the characteristics of low frequency, high entropy data such as ADSL data and high frequency, low entropy data. The Examiner acknowledges that Sun fails to teach a capacitor operably coupled between a primary inductor and a secondary inductor.

U.S. Patent No. 6,067,316 to Amrany et al. ("Amrany")

U.S. Patent No. 6,067,316 to Amrany et al. ("Amrany") teaches a system and method for a communication system configured to communicate both POTS and XDSL. Like Sun, Amrany is concerned with passing base band data (PCM data goes through a D/A converter, which converts it to base band, prior to it being input to circuit 110). Like Sun, the Examiner acknowledges that Amrany fails to teach a capacitor operably coupled between a primary inductor and a secondary inductor. Further, the Examiner acknowledges that Sun and Amrany, in combination, fail to teach a capacitor operably coupled between a primary inductor and a secondary inductor.

U.S. Patent No. 4,803,719 to Ulrich ("Ulrich")

U.S. Patent No. 4,803,719 to Ulrich ("Ulrich") teaches an apparatus and method for powering a telephone apparatus directly from telephone lines without the use of external power. The Examiner relies upon a teaching in Ulrich of the operable coupling of a capacitor between a primary inductor and a secondary inductor, pointing to Figure 3, capacitor C4 and

inductor FILT1, and column 6, lines 32-34. Further, the Examiner asserts that this capacitor is used "for a purpose of eliminating electrical noise on the line".

U.S. Patent No. 6,169,762 to Embree et al. ("Embree")

U.S. Patent No. 6,169,762 to Embree et al. ("Embree"), assigned to Lucent Technologies, Inc., teaches interface devices that provide an interface between a first device and a second device, where the interface device provides electrical isolation between the first device and the second device, and where CODEC processing is distributed between the first-device side and the second-device side of the interface device. The Examiner relies on Embree et al. for the teaching of a shunt regulator for the purpose of protecting the line-side device, making specific reference to Figure 3, shunt regular 312 of Embree. Applicant notes herein that Embree et al. is not prior art, since at the time the present invention was made, it too was assigned to Lucent Technologies, Inc., as set forth in the attached "Microelectronics Patent Committee Invention Submission," dated June 5, 2000, which clearly indicates it as being proprietary information of Lucent Technologies, Inc. Since the subject matter of Embree, which qualifies as prior art only under 35 U.S.C. §102(e), and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person, Embree is not prior art pursuant to 35 U.S.C. §103(c).

The Examiner has not Established a *prima facie* Case of Obviousness

As set forth in the MPEP:

> To establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skilled in the art, to modify the reference or to combine reference teachings.
> MPEP 2143

Applicant has amended and/or added to the independent claims to focus the present invention on the use of a parasitic capacitor between the primary inductor and the secondary inductor, and using a capacitance value for the parasitic capacitor that is as small as possible while still preventing common mode noise signals from interfering with signals being transmitted over the input differential pair. In a preferred embodiment, this capacitance value is in a range of approximately 0.5 pF to approximately 2.5 pF.

Since the Examiner has acknowledged that neither Sun nor Amrany teach a capacitance operably coupled between the primary inductor and the secondary inductor, the focus of this argument turns to the Examiner's assertion that Ulrich teaches a capacitor coupled between the primary and secondary inductors for the purpose of eliminating electrical noise on the line, and the Examiner's assertion that Ulrich teaches that this filter capacitor is in the range of approximately 0.5 to approximately 2.5 pF.

The Examiner references column 6, lines 32-34, and column 2, lines 42-45 of Ulrich[1] and asserts that the parasitic capacitor claimed is taught and that it would have been obvious to incorporate the capacitor allegedly taught by Ulrich in the present invention to achieve the

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1 In a telephone conference with Examiner Pham on May 26, 2005, Examiner Pham clarified that the

claimed invention. Applicant respectfully disagrees. While Ulrich may teach the use of a capacitor and inductor coupled to form a filter, nothing in Ulrich teaches or suggests the use of a parasitic capacitor having a capacitance in the range of approximately 0.5 pF to approximately 2.5 pF. In fact, the capacitance referred to in column 2, lines 42-45 of Ulrich is a 50 μF capacitor used to provide a substantial voltage pulse for actuating a pay telephone. A 50 μF capacitor is equivalent to a 50,000,000 pF capacitor. This is many millions of times larger than the capacitance range claimed in the present invention. Further, referring to the added claim 38, nothing in any of the cited references teaches or suggests minimizing the value of a parasitic capacitor so that it is as small as possible while still preventing common mode noise signals from interfering with signals being transmitted over the input differential pair.

For these reasons, the claimed invention patentably defines over the cited references and are in allowable condition.

To even more clearly point out the differences between the claimed invention and the cited references, applicant notes that the minimization of the capacitance between the primary and secondary is a key element of the present invention. With inductive coupling, there is always some amount of common mode voltage that is present, and the common mode voltage exists over a wide band of frequencies. That very wide band of frequencies can interfere with circuits connected to capacitively coupled circuits and cause the circuits to fail, due to the interference. Sun, in teaching the transfer of base band signals, transfers signals in the

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rejection of claims 8 and 32 is based on Ulrich, not on Prendergast as is indicated in the Office Action.

frequency range between 100 Hz and 4 kHz. By contrast, the present invention is a pass band signaling scheme and will be transmitting signals in the MHz range. Further, as noted above, Sun and Amrany are ADSL systems, which use high entropy data. With high entropy data, the filtering boundaries must be very clearly defined. For example, with ADSL, the filters must have a very clearly-defined pass band, transition band, and stop band. By contrast, the low entropy data being transmitted with the present invention does not require this level of precision and thus can have, for example, low pass filtering and high pass filtering that together attenuates signals over a wide frequency range of approximately 50 kHz to approximately 10 MHz.

Since each of the independent claims specifically recite the minimization of the capacitance of the parasitic capacitor (claims 1, 21, and 30 specifying the range of 0.5 pF to 2.5 pF and newly added claim 38 specifying that the capacitance be minimized according to certain parameters), the claimed invention patentably defines over the prior art.

Conclusion

The present invention is not taught or suggested by the prior art. Accordingly, the Examiner is respectfully requested to reconsider and withdraw the rejection of the claims. An early Notice of Allowance is earnestly solicited.

Enclosed herewith, in duplicate, is a Petition for extension of time to respond to the Examiner's Action, and a Credit Card Payment Form authorizing the payment of the extension

fee. The Commissioner is hereby authorized to charge any additional fees or credit any overpayment associated with this communication to Deposit Account No. 19-5425.

Respectfully submitted

MAY 31, 2005
Date

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U.S. Application No. 09/723,451
Filed November 28, 2000

Enclosure to Reply to Office Action Dated November 11, 2004

"Microelectronics Patent Committee Invention Submission"
Dated June 5, 2000

MICROELECTRONICS PATENT COMMITTEE INVENTION SUBMISSION

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IP LAW USE
Submission No: 122609
Date Received: 6-5-00
Attorney: M. Kurisko

TITLE: INDUCTIVE COUPLING FOR SILICON DAA

Important Notes: (1) Keep in mind that your submission should be written so it can be understood in 5 to 10 minutes by a generalist. Avoid the use of undefined acronyms and jargon. Keep the language simple. (2) Have any of the above submitter(s) discussed this invention with, or provided an invention submission disclosing this invention to, an attorney other than the recipient of this invention submission? ___YES _X_NO

1. **Describe the problem your invention solves:**
   A silicon DAA may employ capacitive coupling to transfer data across a high voltage barrier. Unfortunately many locations contain electrical components that do not meet FCC part 15 requirements. These locations produce common mode voltages that interfere with data transmission across capactively coupled data interfaces.

2. **Based on information of which you are already aware, describe:**
   (i) previous attempts to solve the problem your invention solves:
   Differential capacitive coupling techniques may be employed to improve immunity to these undesired common mode signals. Capacitive coupling may be designed to incorporate high pass filters and low pass filters in addition to differential signaling to gain even more immunity to common mode signals. Other methods reduce the impedance between the controlling port and the high voltage isolated port thus reducing the amplitude of the common mode interference using large value (.01 uF, 3 kilo -Volt rated) capacitors.

   the disadvantages of the previous attempts:

   These techniques have limited success in rejecting very high amplitude (20 Vp-p) common mode signals. The range of frequencies that these common mode signals span is 20 kHz to 10 MHz. These techniques cannot cover this entire frequency span contiguously. Large .01 uF, 3 kilo -Volt rated capacitors are expensive and bulky.

3. **Summarize (30 words or less) the new feature(s) of your invention that solve the problem:**

Inductive coupling through mutual inductance reduces the coupling of common mode signals due to very low capacitance that exists between windings in the implementation that we have chosen for this invention. (1 pF per winding) Inductive coupling reduces the total capacitance by nearly 100 times in one application and therefore prevents the common mode signals from interfering with the desired digital data signals.

Initial Customers: IBM, COMPAQ, HP, DELL, TOSHIBA, XIRCOM, INTEL, SONY

*** Provide the information requested in this box on each page of the submission, as well as drawings, sketches, photographs, etc. ***

Submitter(s) signature(s) and date:

_____ _____ **date**

_____ _____ **date**

_____ _____ **date**

This invention submission has been read and understood by the following two witnesses:

_____ _____ **date**

_____ _____ **date**

4. **Succinctly describe your invention, referring to drawings, sketches, photographs, etc., in sufficient detail to enable one knowledgeable in the invention's field of technology to understand construction and operation of the invention. Drawings, etc., should show only those features necessary for an understanding of the invention. Describe how/why your invention overcomes the disadvantages noted in 2. (ii) above.**

Figure 1 is a drawing of the prior art. This configuration uses differential signaling , high pass filters, low pass filters , which are built into Perseus and Mars receiver circuits, and common mode filters external to Mars and Perseus to achieve rejection of common mode interference that flows through the capacitance coupled high voltage interface. The circuit of Figure 1 does not achieve adequate common mode rejection at frequencies near the cutoff of the inherent low pass filter or near the cutoff of the high pass filter. It is very difficult and expensive to build high pass and low pass filters that have overlapping cut off frequencies. Overlapping cutoff frequencies where the low pass filter extends down below the cut off of the high pass filter is possible only if the low pass filter is a common mode filter. A differential mode filter would disturb the desired signal band. A low frequency common mode low pass filter would need to maintain
very accurate balance, something that becomes more difficult as cut off frequency goes down.

Figure 2 shows how inductive coupling replaces capacitive coupling seen in Figure 1. The mutual inductance of U1 couples the signals across the high voltage interface instead of capacitance. A parasitic capacitance of 0.5pF per wire forms a high pass filter with good medium frequency rejection from approximately 50 to 250 kHz. Common mode balance produces good high frequency rejection from 250kHz to 10 MHz.

Figure 3 shows the common mode response of two different inductive couplers for Ethernet AUI (attachment unit interface) applications. The top trace is from an AUI with 1.5 pF per wire. The bottom trace is from a specially prepared AUI with low capacitance of 0.5 pF per wire. The special AUI maintains 40 dB rejection of common mode signals to 10 MHz. Figure 3 only shows the result up to 1 MHz.

5. **Advantages of your invention:**

The invention of Figure 2 eliminates common mode signals from causing over load to Mars or Perseus circuits shown in Figure 2. These circuits operate from 3 or 5 volt power supply voltages and if the common mode voltage exceeds these power supply voltages, Perseus or Mars receiver circuits will fail. Failure results in loss of data ultimately resulting in corrupted modem signals.

6. **Explain how use of your invention would be detected:**

Visual inspection of modem.

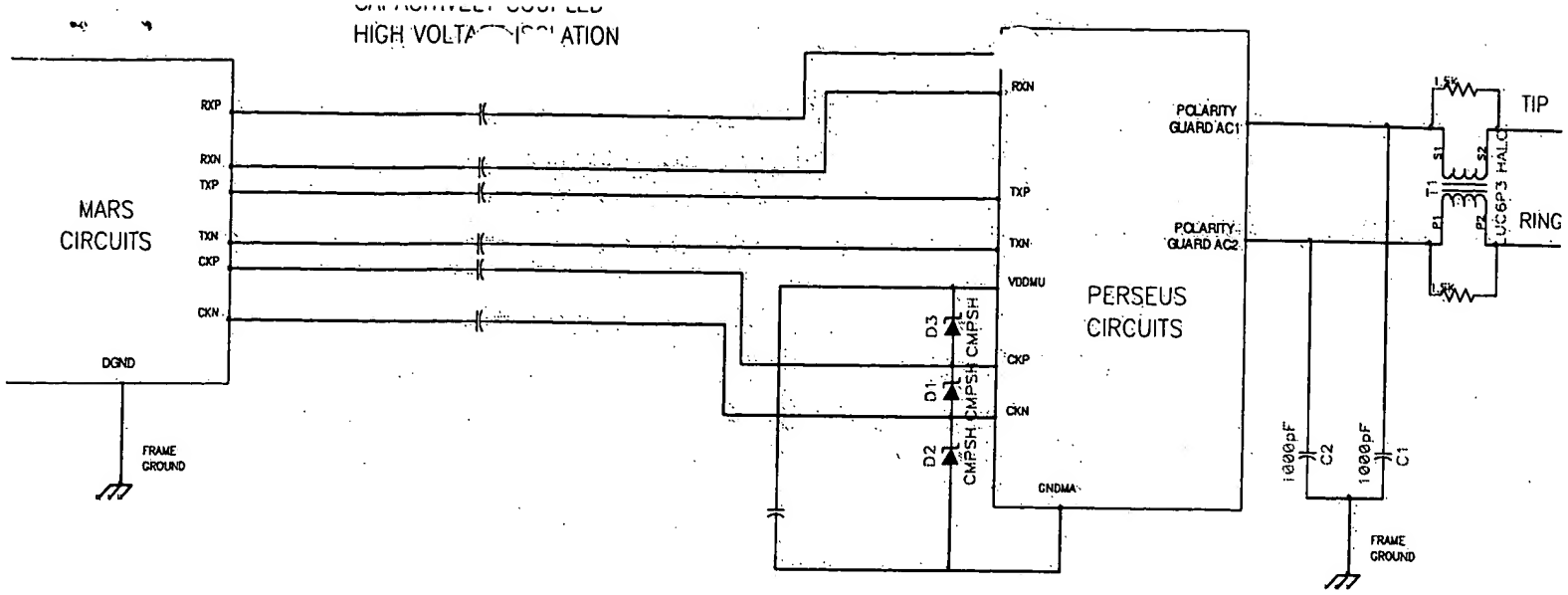

Figure 1 Prior Art

U1 replaces 6 high voltage capacitors.
Capacitve coupling is now 3pF instead
of 330 pF: .5 pF exists between pins
1 – 12 2 – 11 3 – 10
4 – 9 5 – 8 6 – 7

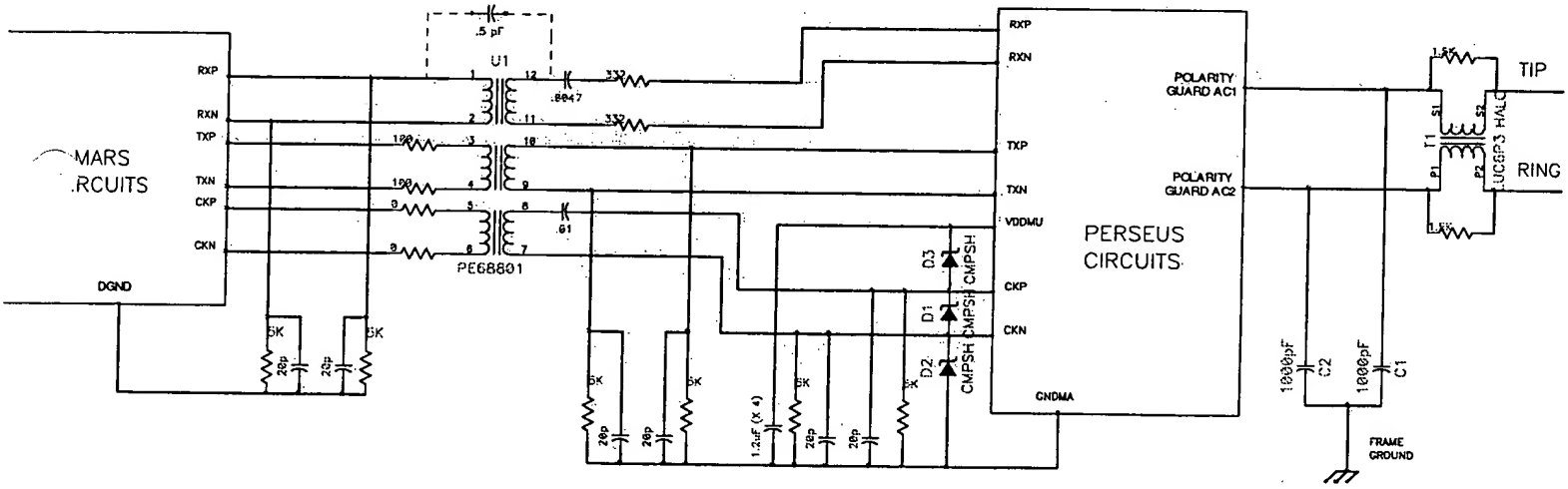

Figure 2 Drawing of Invention

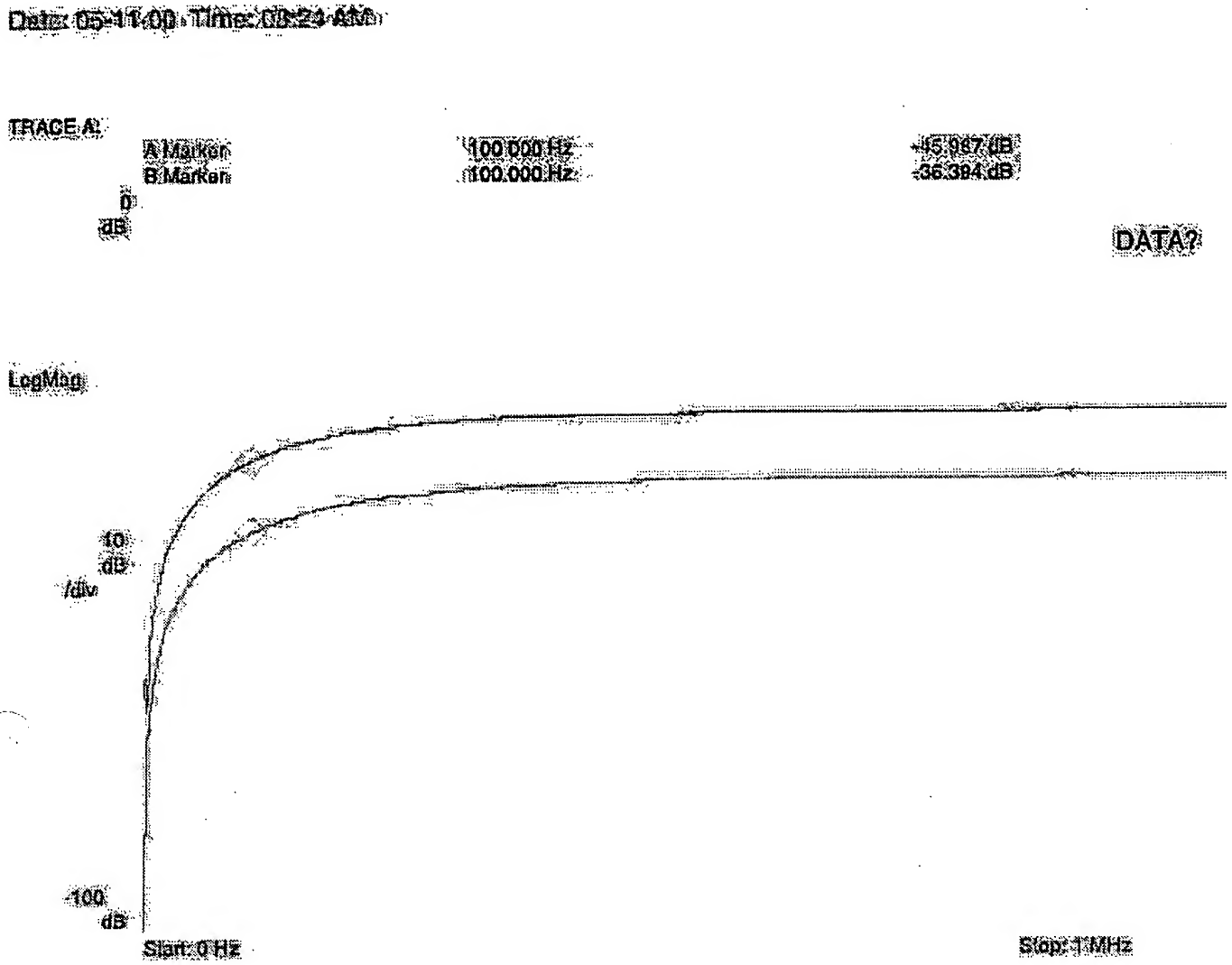

Figure 3 AUI Common Mode Frequency Response